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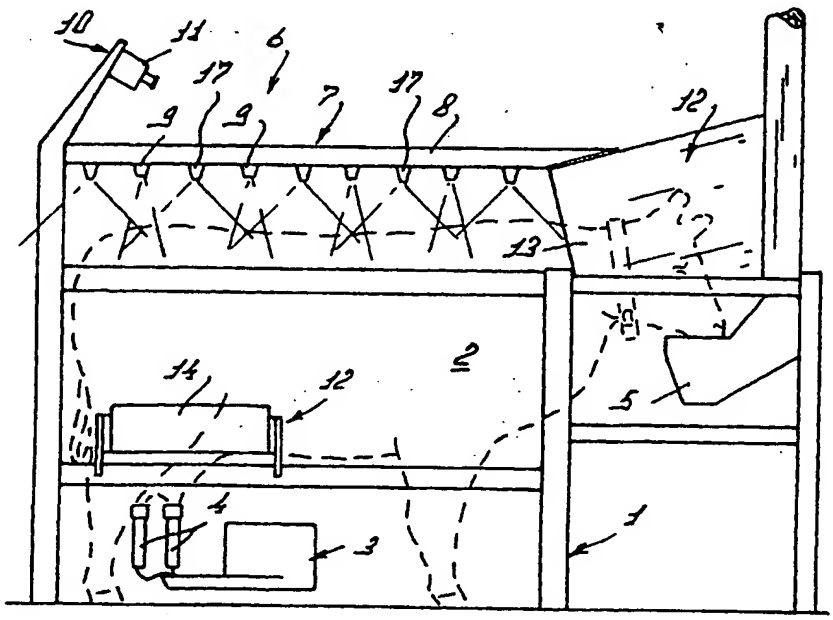
(54) Title: A METHOD OF COOLING ANIMALS



(57) Abstract: The invention relates to a method of cooling animals, such as cows, whereby a liquid is applied between the hairs and/or on the skin of the animal, whereupon air is blown over the liquid. For wetting the animal the liquid is atomized to a fine spray.

WO 01/10197 A1

A METHOD OF COOLING ANIMALS

The invention relates to a method of cooling animals. Such a method is known.

In the known method, water droplets are directed through the stable by means of ventilators for the purpose of cooling the animals.

Such a method has the disadvantage that the water is distributed throughout the stable, so that relatively much water is required. A further disadvantage of the known method is that the air flow is only used for transporting the water droplets.

The invention aims at a method in which the above-mentioned drawbacks are obviated or at least minimized. In accordance with the invention, this is achieved in that a liquid is applied between the hairs and/or on the skin of the animal, whereupon air is blown over the liquid. In this manner the evaporation of the liquid is optimally utilized, so that an optimal cooling of the animal is obtained. According to a further inventive feature, there is obtained an even better cooling if the liquid is atomized to a fine spray. According to another inventive feature, it is also possible to rub the liquid between the hairs and/or on the skin of the animal. According to again another inventive feature, it is further possible to apply the liquid between the hairs and/or on the skin of the animal by rubbing and/or brushing. In order to avoid the use of too much liquid, according to an inventive feature, a previously fixed maximum amount of liquid per animal is applied to the animal.

Upon wetting the animal it is important to avoid the formation of unevenly large droplets, because such droplets evaporate less readily. Furthermore, formation of droplets may result in the liquid reaching undesired places, such as e.g. the teats of an animal to be milked. Therefore, according to an inventive feature, during wetting the animal it is checked whether droplets are formed on the animal's skin or fall from the animal. According to an inventive feature, wetting of the

animal is stopped if formation of droplets is ascertained during wetting. Formation of droplets can be recorded e.g. optically by means of e.g. picture recognition. According to another inventive feature, the back of the animal is cooled. In order to avoid that during wetting certain other parts of the animal come unintentionally into contact with the liquid, according to an inventive feature, during wetting and/or cooling the animal said other parts of the animal are shielded. It is desirable e.g. to shield the head and the udder and/or the teats of the animal. Therefore, the invention also relates to a method of protecting certain parts of an animal, such as a cow, during treating the animal, such as e.g. cooling the animal, whereby at least during part of the treatment the parts of the body to be protected are shielded against the relevant treatment with the aid of shielding means. According to a further inventive feature, the udder or the teats of the animal and/or the animal's head are shielded.

For the purpose of following carefully the cooling process of the animal, according to an inventive feature, during cooling the animal the temperature, in particular the temperature of the skin and/or the body and/or the ambient temperature in the vicinity of the part of the animal to be cooled, is determined. According to another inventive feature, cooling is stopped when a previously set temperature is reached. In order to avoid that the animal is exposed to stress during cooling, according to an inventive feature, the animal's behaviour is observed during cooling, and cooling is stopped if the animal's behaviour changes. According to an aspect of the invention, the animal's behaviour can be deduced from deviations from the previously set number of movements of the animal per unit of time. In practice it has been found that the animals experience cooling as a pleasant sensation during and/or prior to milking. According to the invention, it has further been found that the animals go to the milking stall spontaneously if they are cooled there.

The invention also relates to a method in which stress, such as e.g. heat stress, of the animals to be cooled

is ascertained, whereupon it is decided whether or not to cool the animal as described in the foregoing. The invention also relates to a method in which heat stress is ascertained on the basis of an infrared picture of the animal. The invention also relates to a method in which the period of time during which the animal is cooled and/or the intensity of cooling depend(s) on a heat stress factor which is i.a. derived from the infrared picture.

The invention further relates to a method in which stress, such as heat stress, of the animal is ascertained on the basis of the position of the animal's ears. According to the method, stress, such as heat stress, of the animal is ascertained on the basis of the wetness of the animal's coat. According to a further aspect of the method, stress, such as heat stress, of the animal is ascertained on the basis of the activity of the animal. According to another feature of the method, stress, such as heat stress, of the animal is ascertained on the basis of the expression of the animal's eyes. According to again another aspect of the method, stress, such as heat stress, of the animal is ascertained on the basis of the animal's breath. According to another aspect of the method, stress, such as heat stress, of the animal is ascertained on the basis of the tension of the muscles, in particular of the back muscles, of the animal. According to again another aspect of the method, stress, such as heat stress, of the animal is ascertained on the basis of the fact that the animal is walking with its tongue out.

The invention also relates to an implement for applying the method as described above, whereby the implement is provided with wetting means with the aid of which a liquid reduced to a fine spray is applied to at least part of the animal, in particular between the hairs and/or on the skin of that part of the animal, whereupon an air flow is directed over the wetted part with the aid of air displacing means. According to a further inventive feature, the wetting means comprise a liquid atomization device. By means of the liquid atomization device it is possible to apply a fine spray of

e.g. water to the animal. The wetting means may further comprise a brushing device. According to again another inventive feature, the air displacing means comprise setting means with the aid of which the amount of air to be displaced and/or the velocity of the air to be displaced are/is set. In combination with temperature measurement it is thus possible to control cooling of the animal very accurately. According to a further inventive feature, the implement is arranged in a milking stall and/or a foremilking stall and/or a cleaning box for cleaning certain parts, such as the teats, of the animal, and/or in a post-treatment box. According to again another inventive feature, there is disposed a milking robot in the milking stall, by means of which teat cups are automatically connected to the teats of the animal to be milked.

In accordance with a further aspect of the invention, the implement comprises means with the aid of which stress, in particular heat stress, of an animal is ascertained. According to another inventive feature, the means comprise a camera, such as e.g. an infrared camera. According to again another inventive feature, the means comprise a hydrometer. According to a further inventive feature, the means comprise an odour meter.

The invention will now be explained in further detail with reference to the accompanying drawings, in which:

Figure 1 is a side view of a first embodiment of the invention, and

Figure 2 is a second embodiment of an implement according to the invention.

Figure 1 is a side view of a milk box 1 with a cow 2 present therein. The milk box 1 comprises a milking robot 3 with teat cups 4 which are connected automatically to the teats of the cow 2 by means of the milking robot 3. Near the front side of the milk box 1 there is further disposed a feeding trough 5 to which concentrate can be supplied in metered portions. The milk box 1 is further provided with

regulating means 6 with the aid of which at least one previously determined climate parameter is set artificially in the milk box 1. The regulating means 6 comprise wetting means 7 with the aid of which at least the back of the cow 2 is wetted. The wetting means 7 comprise a sprayer beam 8 with nozzles 9, by means of which a liquid can be atomized to a fine spray. After the liquid reduced to a fine spray has been applied to the back of the cow 2, air is directed over the wetted surface by means of the sprayer beam 8 and the nozzles 9. In this manner the back of the cow 2 is cooled. During wetting the cow 2 it is checked with the aid of the detection means 10 whether or not formation of droplets takes place. To that end the detection means 10 comprise a camera 11. In order to prevent certain parts of the cow 2 from coming into contact with the liquid, the milk box 1 is further provided with shielding means 12. In the present embodiment the shielding means 12 comprise a transparent shielding cap 13 which covers the head of the cow 2 during wetting. The shielding means 12 further comprise a second shielding cap 14 by means of which the udder of the cow 2 can be shielded. The second shielding cap 14 is pivotably fitted to the milk box 1.

Figure 2 shows a second embodiment of the invention, in which parts corresponding to those of the first embodiment are indicated by the same reference numerals. In the second embodiment of the invention, the wetting means 7 comprise motor-drivable brushes 15 which are provided with (non-shown) liquid supply means with the aid of which liquid can be supplied to the brushes 15 during brushing. Thus, the liquid is rubbed in the hair of the cow 2 by means of the brushes 15. The motor-drivable brushes 15 are disposed on a pivotable arm 16 which is connected to the milk box 1. The pivotable arm 16 is further provided with air displacing means 17 with the aid of which air is directed over the wetted surface of the cow 2 after or during brushing.

CLAIMS

1. A method of cooling animals, such as cows, whereby a liquid is applied between the hairs and/or on the skin of the animal, whereupon air is blown over the liquid.

2. A method as claimed in claim 1, characterized in that the liquid is atomized to a fine spray.

3. A method as claimed in claim 1 or 2, characterized in that the liquid is rubbed between the hairs and/or on the skin of the animal.

4. A method as claimed in claim 3, characterized in that the liquid is applied between the hairs and/or on the skin of the animal by rubbing and/or brushing.

5. A method as claimed in any one of the preceding claims, characterized in that for wetting an animal a previously fixed maximum amount of liquid is used per animal.

6. A method as claimed in any one of the preceding claims, characterized in that during wetting the animal it is checked whether droplets are formed on the animal's skin or fall from the animal.

7. A method as claimed in claim 6, characterized in that wetting of the animal is stopped if formation of droplets is ascertained.

8. A method as claimed in any one of the preceding claims, characterized in that the back of the animal is cooled.

9. A method as claimed in any one of the preceding claims, characterized in that during wetting and/or cooling the animal certain parts of the animal are shielded.

10. A method of protecting certain parts of an animal, such as a cow, during treating the animal, such as e.g. cooling the animal, whereby at least during part of the treatment the parts of the body to be protected are shielded against the relevant treatment with the aid of shielding means (12).

11. A method as claimed in claim 9 or 10, characterized in that the udder or the teats of the animal are shielded.

12. A method as claimed in any one of claims 9 to 11, characterized in that the animal's head is shielded.

13. A method as claimed in any one of the preceding claims, characterized in that during cooling the animal the temperature, in particular the temperature of the skin and/or the body and/or the ambient temperature in the vicinity of the part of the animal to be cooled, is determined.

14. A method as claimed in claim 13, characterized in that cooling of the animal is stopped when a previously set temperature is reached.

15. A method as claimed in any one of the preceding claims, characterized in that the animal's behaviour is observed during cooling, and cooling is stopped if the animal's behaviour changes.

16. A method as claimed in claim 15, characterized in that the animal's behaviour is deduced from deviations from the previously set number of movements of the animal per unit of time.

17. A method as claimed in any one of the preceding claims, characterized in that cooling of the animal is carried out just before and/or during milking the animal.

18. A method as claimed in any one of the preceding claims, characterized in that stress, such as e.g. heat stress, of the animals to be cooled is ascertained, whereupon it is decided whether or not to cool the animal as described in any one of claims 1 to 17.

19. A method as claimed in claim 18, characterized in that heat stress is ascertained on the basis of an infrared picture of the animal.

20. A method as claimed in claim 18 or 19, characterized in that the period of time during which the animal is cooled and/or the intensity of cooling depend(s) on a heat stress factor which is i.a. derived from the infrared picture.

21. A method as claimed in any one of claims 18 to 20, characterized in that stress, such as heat stress, of the animal is ascertained on the basis of the position of the animal's ears.

22. A method as claimed in any one of claims 18 to 21, characterized in that stress, such as heat stress, of the animal is ascertained on the basis of the wetness of the animal's coat.

23. A method as claimed in any one of claims 18 to 22, characterized in that stress, such as heat stress, of the animal is ascertained on the basis of the activity of the animal.

24. A method as claimed in any one of claims 18 to 23, characterized in that stress, such as heat stress, of the animal is ascertained on the basis of the expression of the animal's eyes.

25. A method as claimed in any one of claims 18 to 24, characterized in that stress, such as heat stress, of the animal is ascertained on the basis of the animal's breath.

26. A method as claimed in any one of claims 18 to 25, characterized in that stress, such as heat stress, of the animal is ascertained on the basis of the tension of the muscles, in particular of the back muscles, of the animal.

27. A method as claimed in any one of claims 18 to 26, characterized in that stress, such as heat stress, of the animal is ascertained on the basis of the fact that the animal is walking with its tongue out.

28. An implement for applying the method described in any one of claims 1 to 27, which implement is provided with wetting means (7) with the aid of which a liquid reduced to a fine spray is applied to at least part of the animal, in particular between the hairs and/or on the skin of that part of the animal, whereupon an air flow is directed over the wetted part with the aid of air displacing means (8; 17).

29. An implement as claimed in claim 28, characterized in that the wetting means (7) comprise a liquid atomization device (8, 9).

30. An implement as claimed in claim 28 or 29, characterized in that the wetting means (7) comprise a brushing device (15).

31. An implement as claimed in any one of claims 28 to 30, characterized in that the air displacing means (8; 17) comprise setting means with the aid of which the amount and/or the velocity of the air to be displaced is set.

32. An implement as claimed in any one of claims 27 to 31, characterized in that the implement is arranged in a milking stall and/or a foremilking stall and/or a cleaning box for cleaning certain parts, such as the teats, of the animal, and/or in a post-treatment box.

33. An implement as claimed in claim 32, characterized in that a milking robot (3) is disposed in the milking stall.

34. An implement as claimed in any one of claims 28 to 33, characterized in that the implement comprises means with the aid of which stress, in particular heat stress, of an animal is ascertained.

35. An implement as claimed in claim 34, characterized in that the means comprise a camera, such as e.g. an infrared camera.

36. An implement as claimed in claim 34 or 35, characterized in that the means comprise a hydrometer.

37. An implement as claimed in any one of claims 34 to 36, characterized in that the means comprise an odour meter.

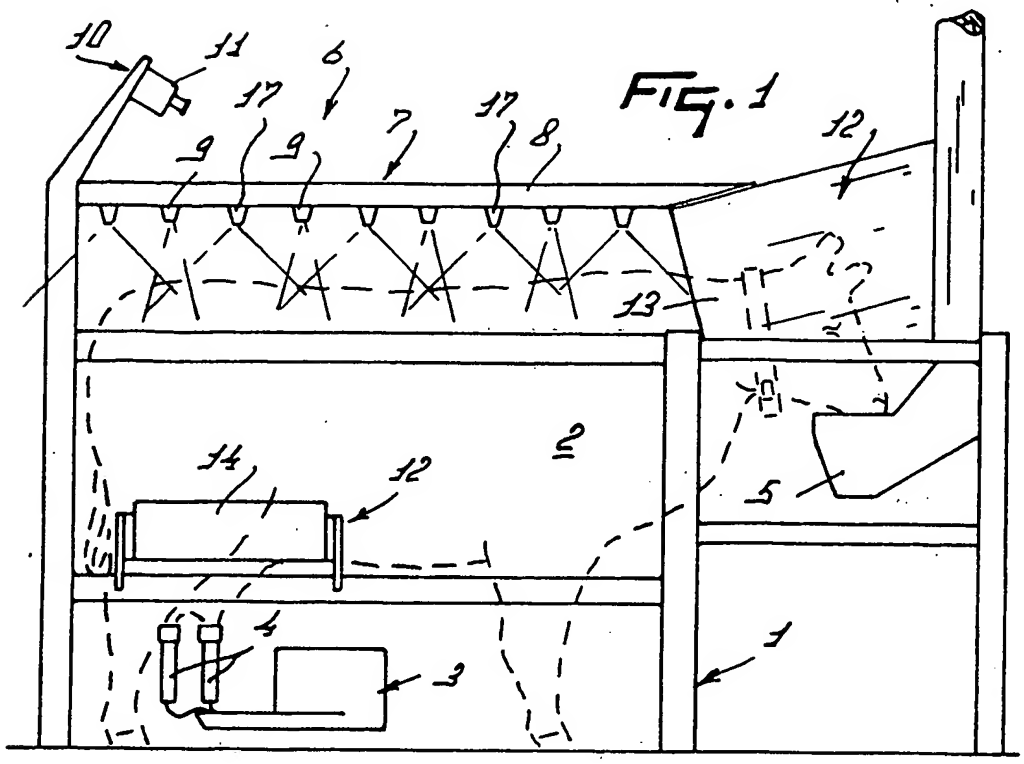


FIG. 1

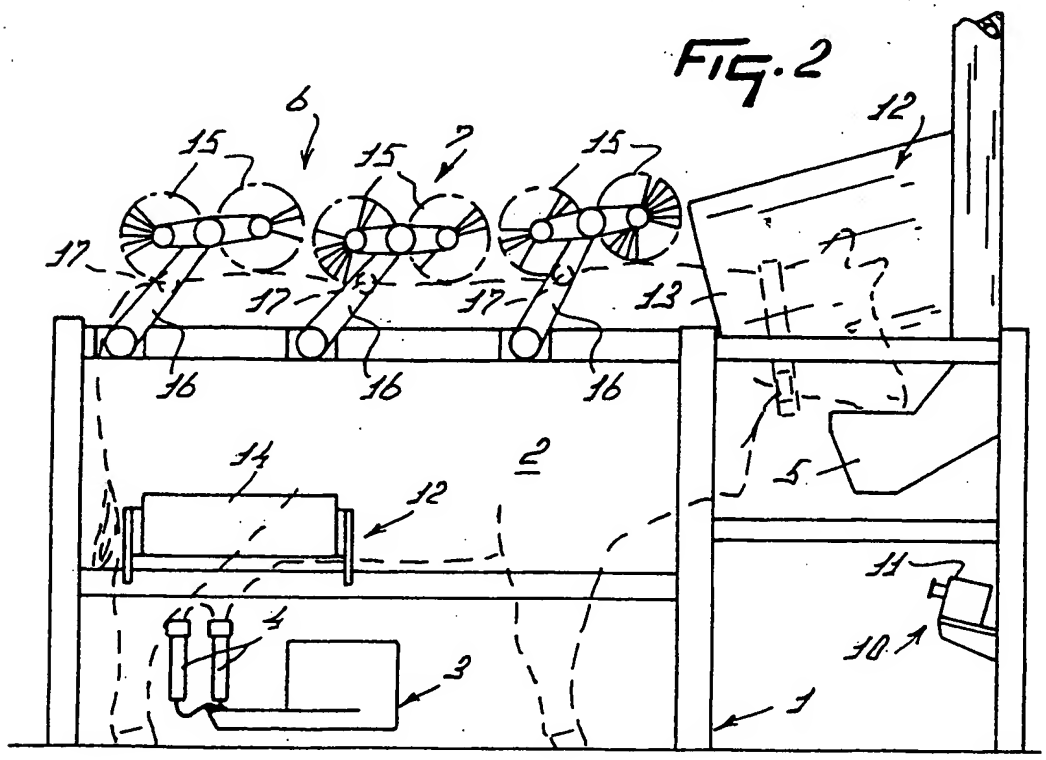


FIG. 2

INTERNATIONAL SEARCH REPORT

International Application No
PCT/NL 00/00504

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A01K13/00 A01K1/00 A01K1/12 A01K1/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A01K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 693 852 A (GORDON) 15 September 1987 (1987-09-15) the whole document ---	1,2,8, 28,29
X	DE 19 26 019 U (SENCZEK) 28 October 1965 (1965-10-28) the whole document ---	10,11
X	DE 314 419 C (HAUPTNER) the whole document ---	10,12
X	BE 439 919 A (AUERGESELLSCHAFT AKTIENGESELLSCHAFT) claim 1; figures 1,2 ---	10,12
X	US 4 345 548 A (KREBS) 24 August 1982 (1982-08-24) abstract; figures 1,2 ---	10
	-/--	

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 September 2000	26. 09. 2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	VON ARX, V

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Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 97 43897 A (MAASLAND N.V.) 27 November 1997 (1997-11-27) page 1-2; figures 1,2	4,30
A	WO 98 04121 A (ALFA LAVAL AGRI AB) 5 February 1998 (1998-02-05)	
A	GB 2 313 032 A (BAKER) 19 November 1997 (1997-11-19)	
A	EP 0 728 413 A (MAASLAND N.V.) 28 August 1996 (1996-08-28)	

INTERNATIONAL SEARCH REPORT

Int. ational application No.
PCT/NL 00/00504

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

1. Claims: 1-9, 13-37

Method and means for cooling animals

2. Claims: 10-12

Method for protecting parts of an animal during treatment

INTERNATIONAL SEARCH REPORT

Information on patent family members

Interna[illegible]tial Application No
PCT/NL 00/00504

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4693852 A	15-09-1987	NONE	
DE 1926019 U		NONE	
DE 314419 C		NONE	
BE 439919 A		NONE	
US 4345548 A	24-08-1982	NONE	
WO 9743897 A	27-11-1997	CA 2226890 A	27-11-1997
		EP 0840547 A	13-05-1998
		JP 11509740 T	31-08-1999
		NZ 329753 A	29-06-1999
		US 5970911 A	26-10-1999
WO 9804121 A	05-02-1998	AU 3563097 A	20-02-1998
		EP 0915645 A	19-05-1999
		US 6079360 A	27-06-2000
GB 2313032 A	19-11-1997	NONE	
EP 728413 A	28-08-1996	NL 9500363 A	01-10-1996
		NL 1001336 C	28-08-1996
		JP 9512181 T	09-12-1997
		WO 9625846 A	29-08-1996
		US 5816190 A	06-10-1998

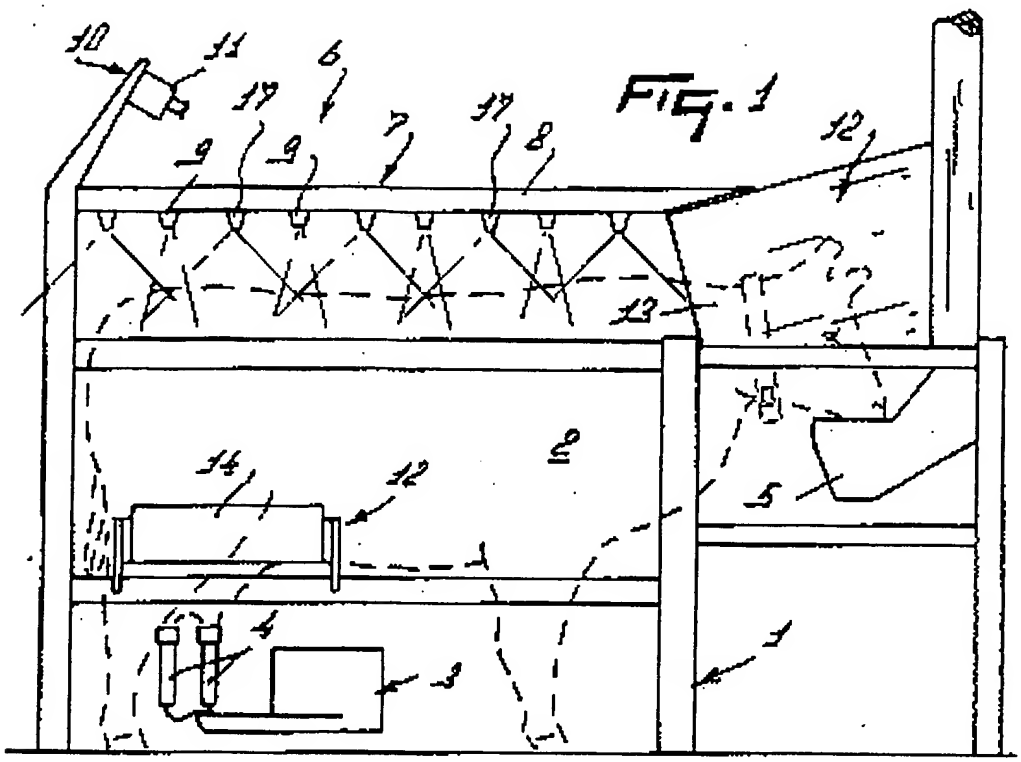

FIG. 1

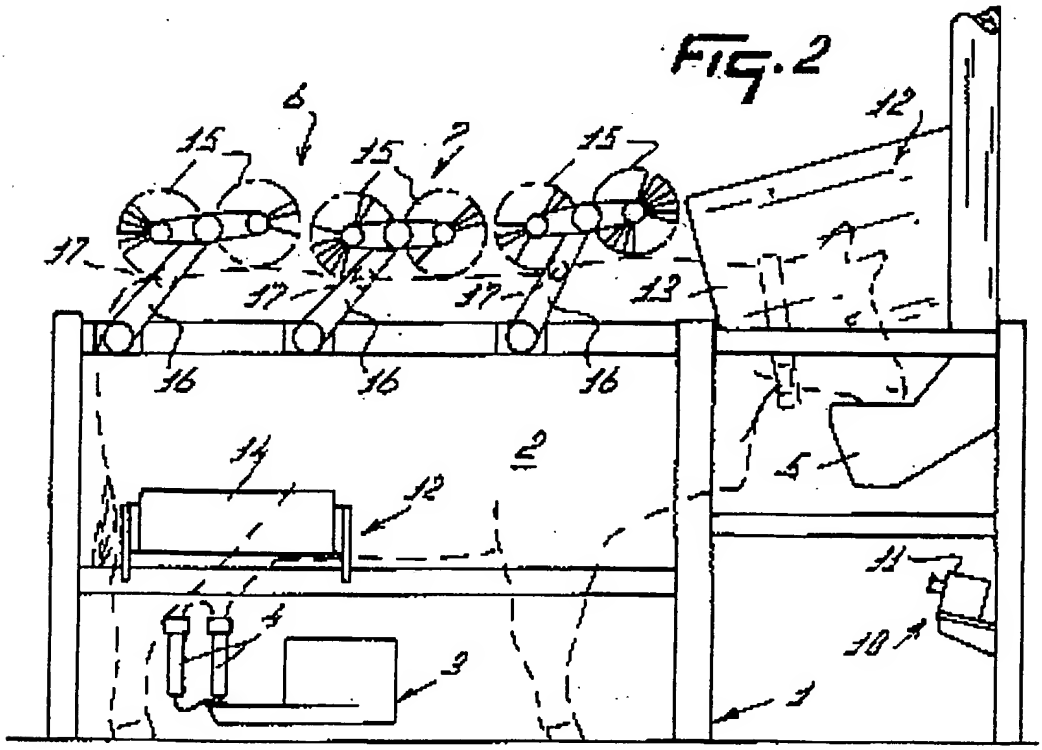

FIG. 2